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CONSELHO NACIONAL DE DESENVOLVIMENTO CIENTÍFICO E TECNOLÓGICO

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1983 (Instituto de Pesquisas Espaciais, São  
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13. Authorized by  <i>Nelson de Jesus Parada</i> <i>Parada</i> <i>Director</i>			
14. Abstract/Notes  <p><i>The main objective of this report is to present the current status of the Brazilian LANDSAT facilities and the results achieved during the period of October 01, 1982 to March 31, 1983.</i></p>			
<p>Original photography may be purchased      from EROS Data Center      Sioux Falls, SD 57198</p> <p>15. Remarks Prepared for the IV LTWG (Landsat Technical Working Group) meeting - April 19-21/1983, Frascati, Italy.</p>			

## CONTENTS

	<u>Page</u>
<b>LIST OF FIGURES .....</b>	<b>iii</b>
<b>1. <u>CNPq/INPE LANDSAT SYSTEM STATUS .....</u></b>	<b>1</b>
<b>1.1 - Cuiabá tracking and receiving station .....</b>	<b>1</b>
<b>1.2 - Electronic and photographic processing labs. ....</b>	<b>2</b>
<b>1.3 - Data distribution centers .....</b>	<b>4</b>
<b>2. <u>CNPq/INPE LANDSAT-4 PROJECT STATUS .....</u></b>	<b>4</b>
<b>2.1 - Receiving subsystem .....</b>	<b>4</b>
<b>2.2 - Recording subsystem .....</b>	<b>4</b>
<b>2.3 - Processing subsystem .....</b>	<b>5</b>
<b>2.4 - Main chronogram of activities .....</b>	<b>5</b>
<b>2.5 - Preliminary TM product produced by the Brazilian station.</b>	<b>8</b>
<b>3. <u>TECHNICAL QUESTIONS RELATED TO DOCUMENT REVISION 6 .....</u></b>	<b>11.</b>
<b>ANNEX A - MAP OF COVERAGE FOR THE CUIABÁ STATION - LANDSAT 4</b>	
<b>ANNEX B - REVISED PRICE LIST</b>	
<b>ANNEX C - ADDITIONS IN THE TABLE "MEMBER's STATION TAPE RECORDER'S CHARACTERISTICS"</b>	
<b>ANNEX D - ANSWERS TO ACTION ITEMS FROM THE 3rd LTWG</b>	

## LIST OF FIGURES

	<u>Page</u>
1 - New antenna (S and X bands) at Cuiabá Station .....	3
2 - The new TM processing subsystem to be installed at Cachoeira Paulista .....	6
3 - Color composition of a TM image over Detroit, USA using bands 1, 3 and 4 .....	9
4 - Color composition of a TM image over Detroit, USA using bands 1, 2 and 3 .....	10

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## 1. CNPq/INPE LANDSAT SYSTEM STATUS

### 1.1 - CUIABA TRACKING AND RECEIVING STATION

Since Aug. 82 that INPE is recording MSS data from LANDSAT-4. The first orbit was received on Aug. 23, still with the former receiving system. The new system started its operations on Sep. 9, 82. The station had operated normally, recording LANDSAT-4 MSS data from this date up to October 04, when a thunderbolt caused severe damages in the new installed equipment. The back-up system (the old one) resumed the operation allowing the continuity of data acquisition. Several damaged equipments returned to Scientific Atlanta for repairing. The new system was again activated by March 24, 83.

LANDSAT-4 S-band 8 kbits telemetry data started to be recorded only after Dec. 28, 82 due to delay in the required modification of the telemetry data tape recorder (existent tape recorded was in a configuration for 16 bits).

From Feb. 1st, 83 up to March 31, 83 the station restarted the recordings of LANDSAT-3 RBV data.

On February 5 and 6, 83 NASA transmitted to the station, for check purposes, X-band signals (MSS and PN code).

From October 1st, 82 to February 28, 83 the station recorded:

LANDSAT 3: no MSS orbits  
45 RBV orbits

LANDSAT 4: 261 MSS orbits  
no TM orbits

LANDSAT-4 revised map of coverage for Cuiabá station is attached in Annex A.

The new antenna (S and X bands) can be seen in Figure 1.

#### 1.2 - ELECTRONIC AND PHOTOGRAPHIC PROCESSING LABS.

During the period of October, 82 to February, 83 both labs. operated normally, producing CCT's and 70 mm films, under user request only.

MSS Quick-Look data are produced from the full archival, and related information is presented in the user catalog for dissemination purposes.

Cartographic products from MSS data: 144 pilot maps in the scale 1:100.000 were produced during the year of 1982. The LANDSAT images are being operationally used as topographic source to update existing maps (53 maps in the scale 1:250.000 have been updated in 1982) and also for the production of planimetric maps in the scale 1:250.000.

From October 1st, 82 to February 28, 83 the labs. produced:

70 mm films: 47 new orbits and 22 regenerations for the archival  
CCT's: 45 scenes

(A LANDSAT orbit for the Brazilian Station has an average of 22 scenes)



Fig. 1 - New antenna (S and X bands) at Cuiabá Station.

### 1.3 - DATA DISTRIBUTION CENTERS

Five users centers operated normally during the period of this report. A sixth users center will be installed at Manaus by April, 83.

Today the number of users in the system is 1323 (208 from foreign countries).

A new price list is being issued, with the date of enter into force of Apr. 1st, 83. The main modification is the reduction of NOAA distribution fee for LANDSAT 1, 2 and 3 products. This fee will be applied only for LANDSAT-4 products, acquired after Oct. 1st, 82.

See the new price list in Annex B.

## 2. CNPq/INPE LANDSAT-4 PROJECT STATUS

### 2.1 - RECEIVING SUBSYSTEM

The installation and acceptance test have been done in mid-Aug./Sep., 82. Final acceptance occurred on Sep. 9, 82.

### 2.2 - RECORDING SUBSYSTEM

Only the tape recorder model HYWL/MM 28 tracks is installed at Cuiabá, since Nov. 22, 82. See additions in the table "Member's station tape recorder characteristics" in Annex C.

Partial acceptance tests in France were done in Jan./Feb., 83. Complete test will occur up to the middle of April. The installation and final acceptance test in Brazil is scheduled to start no later than May, 83.

### **2.3 - PROCESSING SUBSYSTEM**

The system integration phase will be finished by the end of March, 83. Acceptance tests in France will occur during Apr., 83. Installation in Brazil and final acceptance tests are schedule to occur in Jun./Jul., 83.

A TM HDDT with real data over Detroit was received from NASA Oct., 82 during last LTWG. This tape contains only TM bands 1 to 4. See example images at item 2.5.

One INPE's engineer was received at Goddard on Feb. 10, 83 by NASA-LANDSAT 4 office. Question concerning several items related to TM geometry, calibration and S-band telemetry data format were answered in this meeting.

Revision 6 was received by INPE on Mar. 23, 83. Written questions were transmitted to NASA on March 28, 83. See item 3 of this report.

Studies concerning TM-CCT geometric corrections for INPE's processing system will be started just after the end of the installation in Brazil.

The new TM processing subsystem can be seen in Figure 2.

### **2.4 - MAIN CHRONOGRAM OF ACTIVITIES**



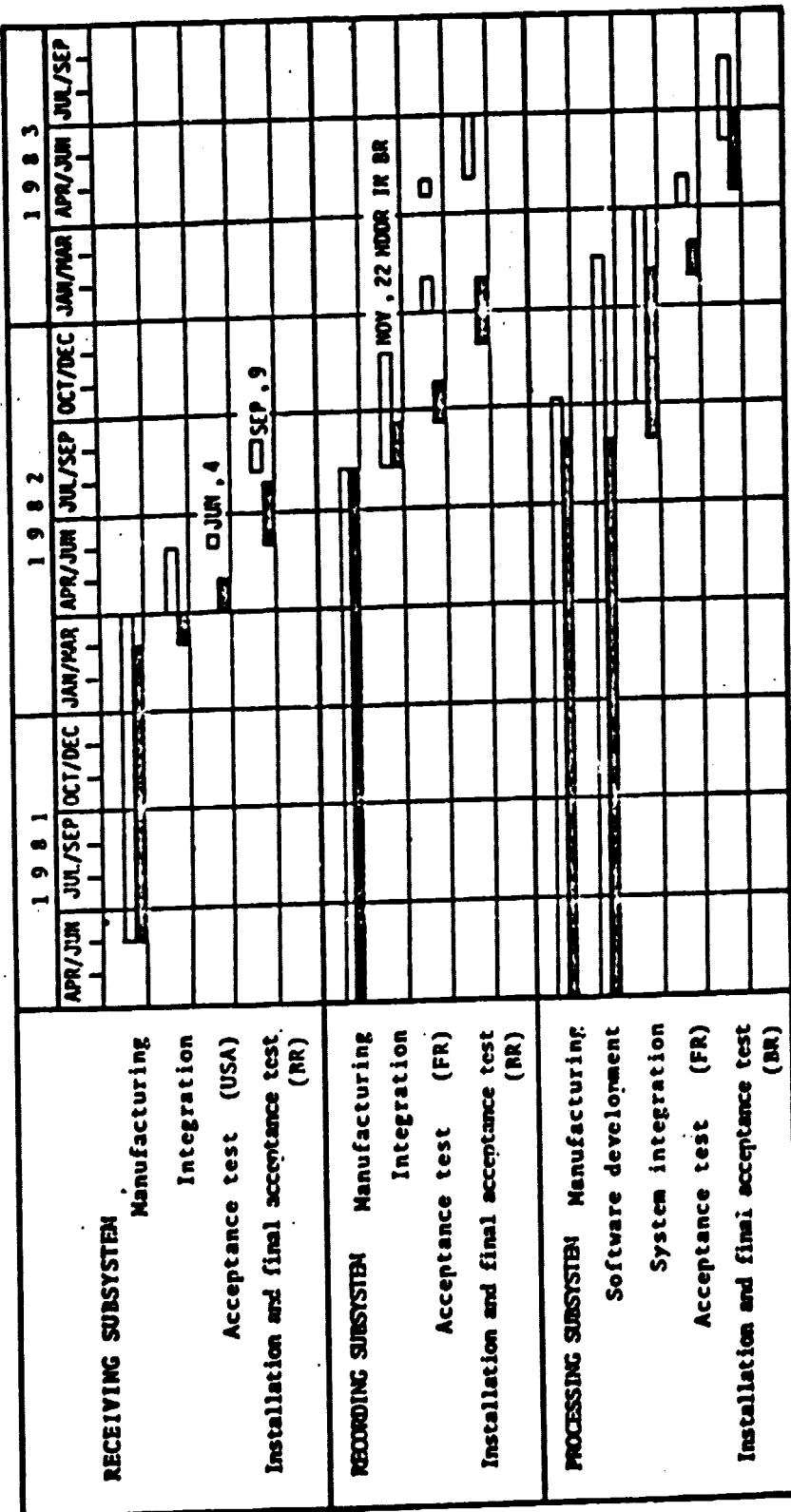
Fig. 2 - The new TM processing subsystem to be installed at Cachoeira Paulista.

BRAZIL

CNpq / INPE - Landsat - 4 project  
Main chronogram of activities  
Prepared for the Fourth LTNG - April. 83

- 7 -

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**2.5 - PRELIMINARY TM PRODUCT PRODUCED BY THE BRAZILIAN STATION**

**See examples in the following Figures**

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COLOR PHOTOGRAPH

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A 0

A 1

A 2

A 3

A 4

BRAZIL - NFG (IND)

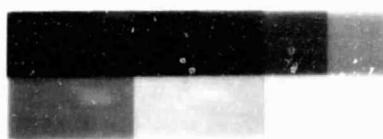
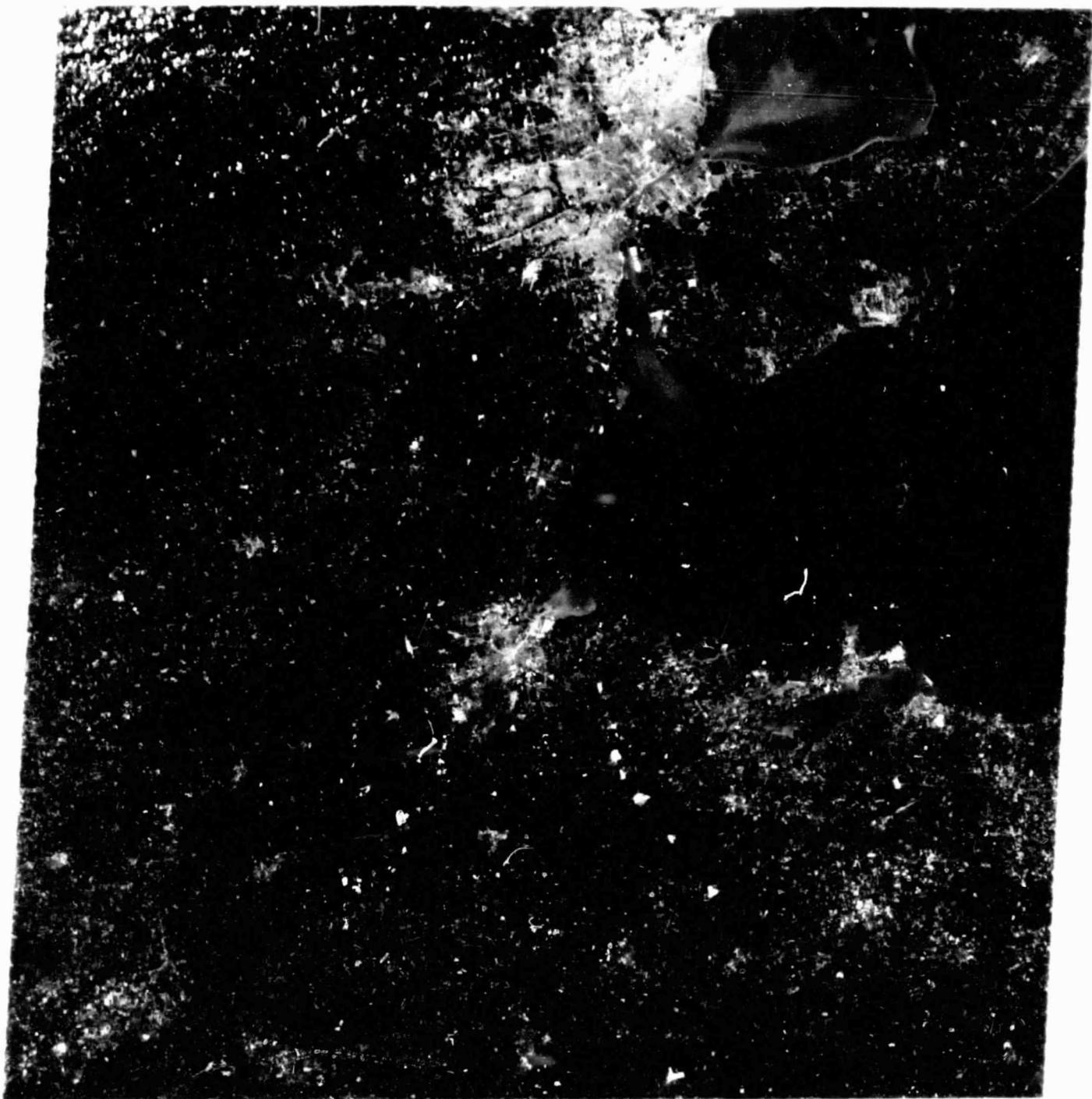
019D059

TM4-00130-T076

TM4-00130-019-059-T076/1 001

**Fig. 3 - Color composition of a TM image over Detroit, USA  
using bands 1, 3 and 4.**

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COLOR PHOTOGRAPH



019D059  
TM4 00130 059T076/2 001

A B C D E F G H I J K L M N  
V V V V V V V V V V V V V V V V

TM4 00130[019]059T076/2 001

Fig. 4 - Color composition of a TM image over Detroit, USA  
using bands 1, 2 and 3.

### 3. TECHNICAL QUESTIONS RELATED TO DOCUMENT REVISION 6

(sent to NASA by telex on March 29, 1983)

1. Please give an explanation about the relative positioning between forward and reverse scans.

Considering the odd sensor for the same band, we have made an image using as initial pixel the minor frame 7 (for forward scans) and minor frame 6313 (for reverse scans). Applying the delays given in Table C-2 of Appendix C, revision 6, we still have an offset of about 4 to 5 pixels between forward and reverse scans.

We have not found in the given offsets the explanation for this difference.

A test for band 6 was not done, because we don't have image data for this band.

2. Page 61 of revision 6: Must we consider the temperature counts in the telemetry data in the range of -128 to 127 or in the range of 0 to 255?

3. Page 58 of revision 6: Please explain the meaning of the following serial words:

- word B, bit 7                    cold stage telemetry on/off
- word D, bits 3 to 5:            calibration lamps override
- word E, bits 3 and 4:          blackbody T2/T3 on/off

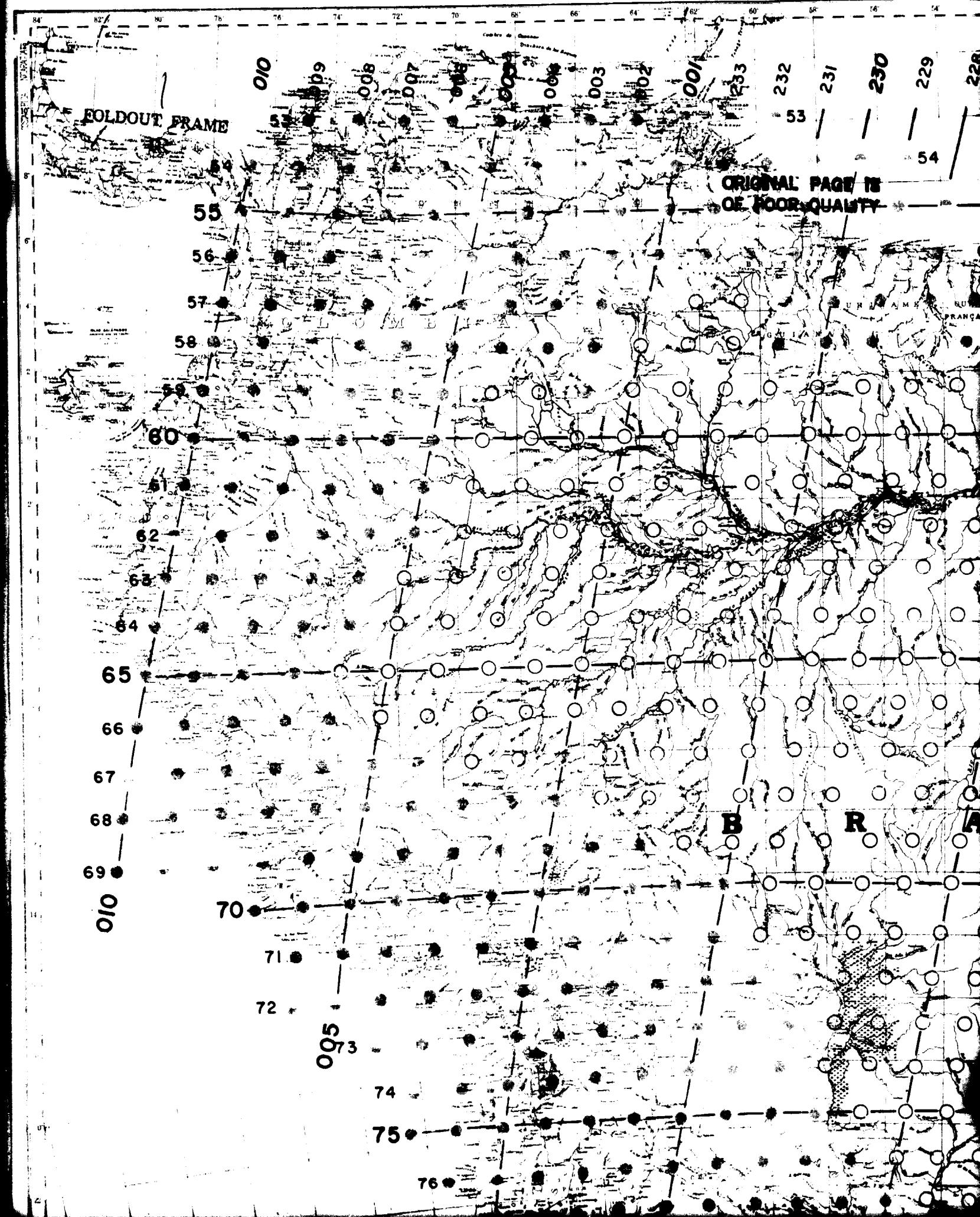
4. Page 62 of revision 6: the scan line corrector and the calibration shutter hub temperature coefficients are the same except for a power of ten in coefficient A4 and a signal in coefficient A5. Are these coefficients correct or there is a mistype?

5. Page 62 of revision 6: Please verify the coefficients for relay optics, primary mirror and secondary mirror temperatures. Are they correct?

6. Page 63 item m: in the case of a frame error, must we consider the data and timing valids for the major frame?
7. ADS data in PCD: page 47 of revision 6, first paragraph, contradicts with page 9 of attachment 18 of the previous LTWG proceedings. This one says that digital count zero is maximum negative displacement, while the first says that zero is maximum positive displacement.  
Which one is correct?
8. Table F1, page F-4 of revision 6: ACS to TM coordinate transformation matrix seems to have a mistype in elements C13 or C31. Please, verify.
9. Can NASA provide us a TM HDDT with data in all bands? We need this in order to conclude radiometric and geometric corrections functions testing.

ANNEX A

MAP OF COVERAGE FOR THE CUIABA STATION - LANDSAT 4



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CNPq

INPE

Conselho Nacional de Desenvolvimento  
Científico e Tecnológico  
Instituto de Pesquisas Espaciais  
Departamento de Geração de Imagens de Satélite.  
Cachoeira Paulista - São Paulo  
Brasil

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MAPA ÍNDICE  
COBERTURA DO LANDSAT "4"

2 FOLDOUT FRAME

R A S I L

72  
05  
073

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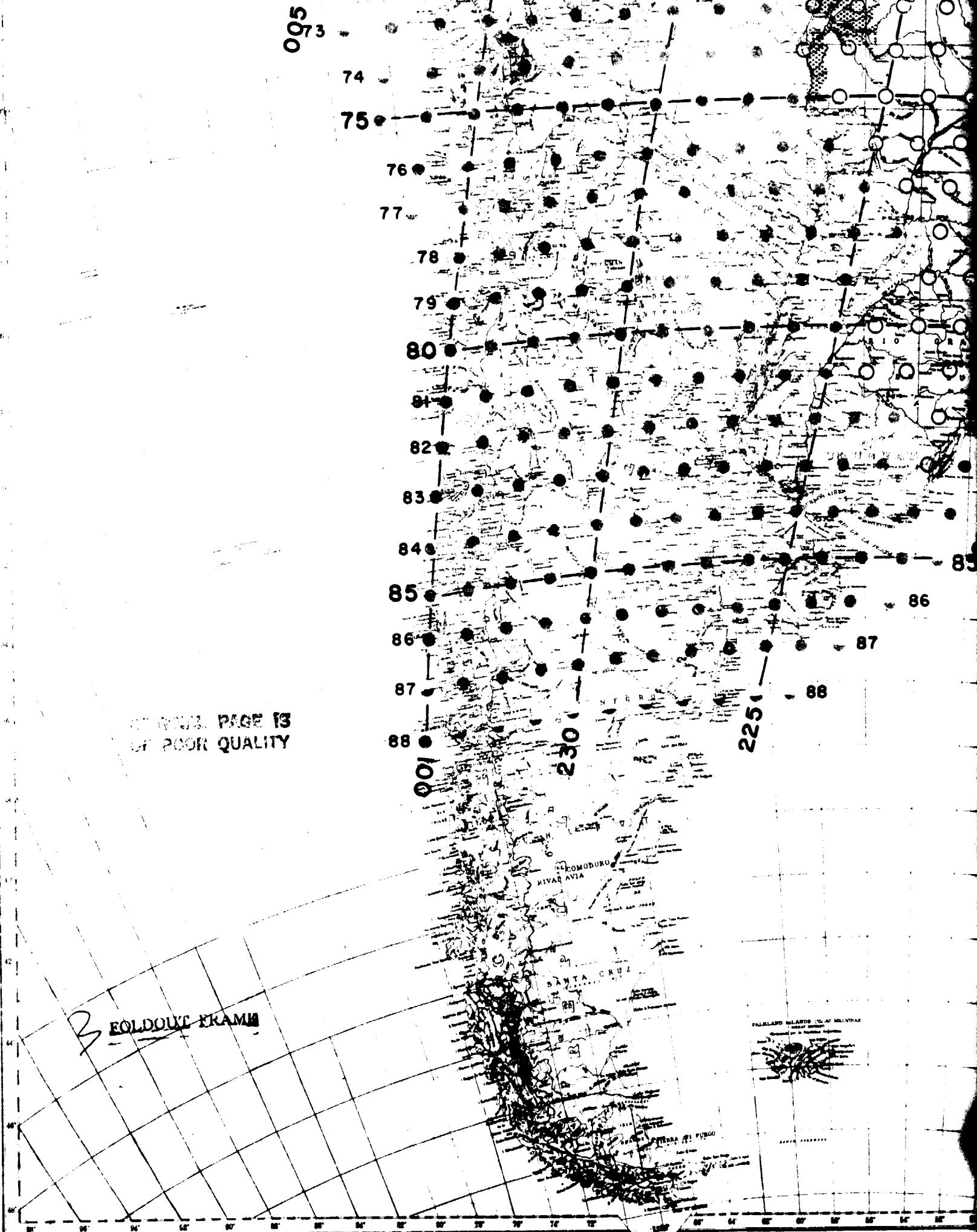
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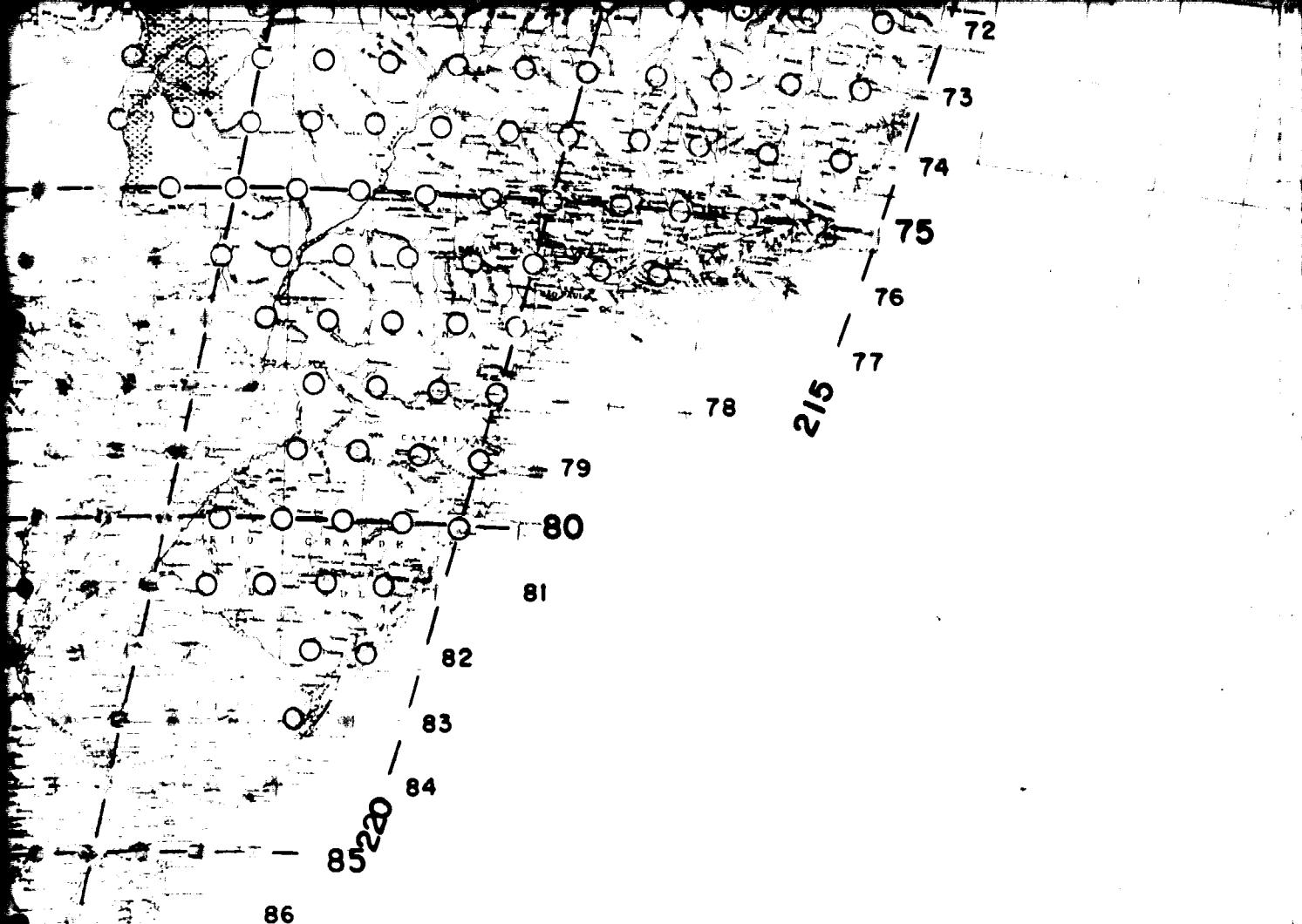
SANTA CRUZ

ECOMODURO

RIVAR AVIA

FALMOUTH ISLANDS ISLET MOUNTAIN





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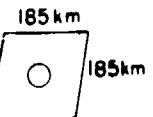
 FOLDOUT FRAME

### LEGENDA

- \* Limite norte da grade continental útil
- Limite sul da grade continental útil

### ESCALA

1 / 15000.000



O centro da imagem pode variar/  
da coordenada nominal em torno  
± 20 Km

ANNEX B

REVISED PRICE LIST

PRICE LIST

LANDSAT DATA

PHOTOGRAPHIC PRODUCTS

IMAGE SIZE <u>MSS</u> <u>CODE</u>	SCALE	FORMAT	BLACK & WHITE		COLOR COMPOSITE	
			UNIT PRICE	CODE	UNIT PRICE	CODE
50 mm 1	1:3,704,000	Film Positive	US\$ 44.00	25	-	-
50 mm 1	1:3,704,000	Film Negative	53.00	26	-	-
185 mm 2	1:1,000,000	Film Positive	89.00	25	US\$ 113.00	28
185 mm 2	1:1,000,000	Paper	53.00	27	89.00	29
370 mm 3	1:500,000	Paper	116.00	27	149.00	29
740 mm 4	1:250,000	Paper	228.00	27	-	-
<u>RBV</u>						
50 mm 0	1:1,980,000	Film Positive	44.00	39	-	-
50 mm 0	1:1,980,000	Film Negative	53.00	40	-	-
198 mm 3	1:500,000	Film Positive	89.00	39	-	-
198 mm 3	1:500,000	Paper	53.00	41	-	-
396 mm 4	1:250,000	Paper	116.00	41	-	-
990 mm 5	1:100,000*	Paper	250.00	41	-	-

HIGH CONTRAST PHOTO PRODUCTS (MSS DATA)

A new electronic/photographic processing is available for photo products in all sizes, at three times the normal processing price. Recommended for the Amazonian Region.

COMPUTER COMPATIBLE TAPES (CCT)

TYPE	CODE	TRACKS	BPI	FORMAT	PRICE
Bulk	35	9	800	2 tapes (set)	US\$ 605.00
"Edge-Enhanced	38	9	800	2 tapes (set)	1,075.00

CCT's are normally shipped air freight collect. Note that there is a delay of four weeks to obtain the export license.

NOTES:

- \* RBV data in the scale 1:100,000 also available under special request and controlled by EMFA (Armed Forces Ministry) based on present law for aerial material distribution.
- The payment must be made in advance, through a nominal check to Instituto de Pesquisas Espaciais.
- The photo-product prices include air mail delivery.
- Minimum order: US\$ 88.00.
- Prices valid from April 1st, 1983 (subject to change).

April, 1983

*Parada*  
Nelson de Jesus Parada  
Director

ANNEX C

ADDITIONS IN THE TABLE

"MEMBER'S STATION TAPE RECORDERS CHARACTERISTICS"

ADDITION TO THE EXISTENT EQUIPMENTS

STATION LOCATION	DATA RECORDED	Nº MANUFACTURER	MODEL NUMBER	NUMBER OF TRACKS	TYPE OF RECORDING	RECORDING LEVEL	RECORDING SPEED/RATE (NOMINAL)	PLAYBACK SPEED/RATE	DENSITY	
Cuiabá Brazil	TM/MSS	1	HYWL/MM	2879 L	28	Serial I/O	ECL	127.4, 22.6 ips (84.9 Mb/s 15 Mb/s)	127.4, 22.6 ips (84.9 Mb/s 15 Mb/s)	33.3 Kbps
C. Paulista Brazil	TM/MSS*	1	HYWL/MM	2879 L	28	Serial I/O	ECL	127.4, 38.9, 22.6 ips	127.4, 38.9, 22.6 ips	33.3 Kbps

\* Available from June, 83 on.

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ANNEX D

ANSWERS TO ACTION ITEMS FROM THE 3rd LTWG

1 - Action item number 11

- Q1. Manual location of visually recognized points
- Q2. Interpolation between known points
- Q3. a) Lat-Long/Line-Pixel equations  
b) Lat-Long of all known control points
- Q4. Degree and decimal fraction
- Q5. We suggest the use of item 2.1.6.1 for hemispheric information; item 2.1.7(1) for precision information; inclusion of elevation information as defined in item 3.2
- Q6. N.A.
- Q7. N.A.
- Q8. N.A.
- Q9. Separate ancillary records as suggested in the October 1982 meeting
- Q10 to Q14. N.A.

2 - Action item number 12

- Q1. We use the brazilian CCT format. One of the IAG uses the tape as it is.  
The other one reads and formats it to a disk.  
Note that we are moving now to TM-CCT format as defined by the LTWG.
- Q2. - number of lines/samples per line  
- always single byte binary  
- overlap (in pixels) of adjacent image strips
- Q3 to Q9. N.A.